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On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXIV

О нескольких новых или плохоизученных ориентальных Paradoxosomatidae (Diplopoda: Polydesmida), XXIV

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KEY WORDS: Diplopoda, Polydesmida, Paradoxosomatidae, taxonomy, new records, new species, Indonesia, Thailand, Vietnam

КЛЮЧЕВЫЕ СЛОВА: Diplopoda, Polydesmida, Paradoxosomatidae, таксономия, новые находки, новые виды, Индонезия, Таиланд, Вьетнам

ABSTRACT. This contribution is devoted to new records of nine known species from Indonesia, Thailand or Vietnam, as well as to descriptions of three new species: *Dendrogonopus aster* sp.n., from the Papua Province, New Guinea, Indonesia, *Tylopus monospinosus* sp.n. and *T. tuberculatus* sp.n., both latter taxa from the Gia Lai Province, southern Vietnam.

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РЕЗЮМЕ. Данное сообщение посвящено находкам девяти известных видов из Индонезии, Таиланда и Вьетнама, а также описаниям следующих трех новых видов: *Dendrogonopus aster* sp.n., из провинции Папуа (Новая Гвинея, Индонезия), *Tylopus monospinosus* sp.n. и *T. tuberculatus* sp.n., оба последних таксона из провинции Зялай (Южный Вьетнам).

Introduction

This paper is devoted to new records of nine known species from Indonesia, Thailand or Vietnam, as well as to descriptions of three new species, one from Indonesia and the other two from Vietnam.

Material and methods

All material treated below is deposited in the collection of the Zoological Museum, Moscow State University, Russia. Live animals in the field were photographed by the second author, whereas the remaining colour pictures were taken in the lab with a Canon EOS 5D digital camera and stacked using Zerene Stacker software.

Taxonomic part

Anoplodesmus anthracinus Pocock, 1895

MATERIAL. 2 ♂♂, 1 ♀, 5 juv., Thailand, Phuket Island, Old Phuket Karon Beach Resort, N 7°50′39″, E 98°17′40″, 8 m a.s.l., 23–26.III.2018, leg. I.V. Enushchenko.

REMARK. This species has recently been recorded from Phuket Island, Thailand [Golovatch, Semenyuk, 2018].

Annamina irinae Golovatch, Geoffroy et Akkari, 2017

MATERIAL. 3 ♂♂, Vietnam, Gia Lai Province, Kon Ka Kinh National Park, N 14°13′25″, E 108°20′02″, 1400 m a.s.l., upper part of hill with mixed tropical forest, on forest floor, V.2017; 1 ♂, 1 ♀, same locality, N 14°12′46″, E 108°18′55″, 800 m a.s.l., bottom of river valley, wet broadleaved tropical forest, on bush, V.2017; 7 ♂♂, same locality, N 14°12′43″, E 108°18′57″, 900 m a.s.l., bottom of river valley, wet broadleaved tropical forest, on bush, V.2017, all leg. I.I. Semenyuk.

REMARK. Since this species has been described from the same locality [Golovatch *et al*., 2017], the above samples may be regarded as strict topotypes.

Antheromorpha harpaga (Attems, 1937)
Figs 1–10.

MATERIAL. 2 ♂♂, Vietnam, Gia Lai Province, Kon Ka Kinh National Park, near Krong, N 14°18′22″, E 108°27′07″, 680 m a.s.l., steep slopes of river valley, mixed tropical forest, on forest floor, V.2017; 2 ♂♂, same locality, N 14°18′36″, E 108°26′43″, 650 m a.s.l., slopes of river valley, mixed tropical forest, in leaf litter, V.2017; 1 ♂, same locality, N 14°18′03″, E 108°26′42″, 600



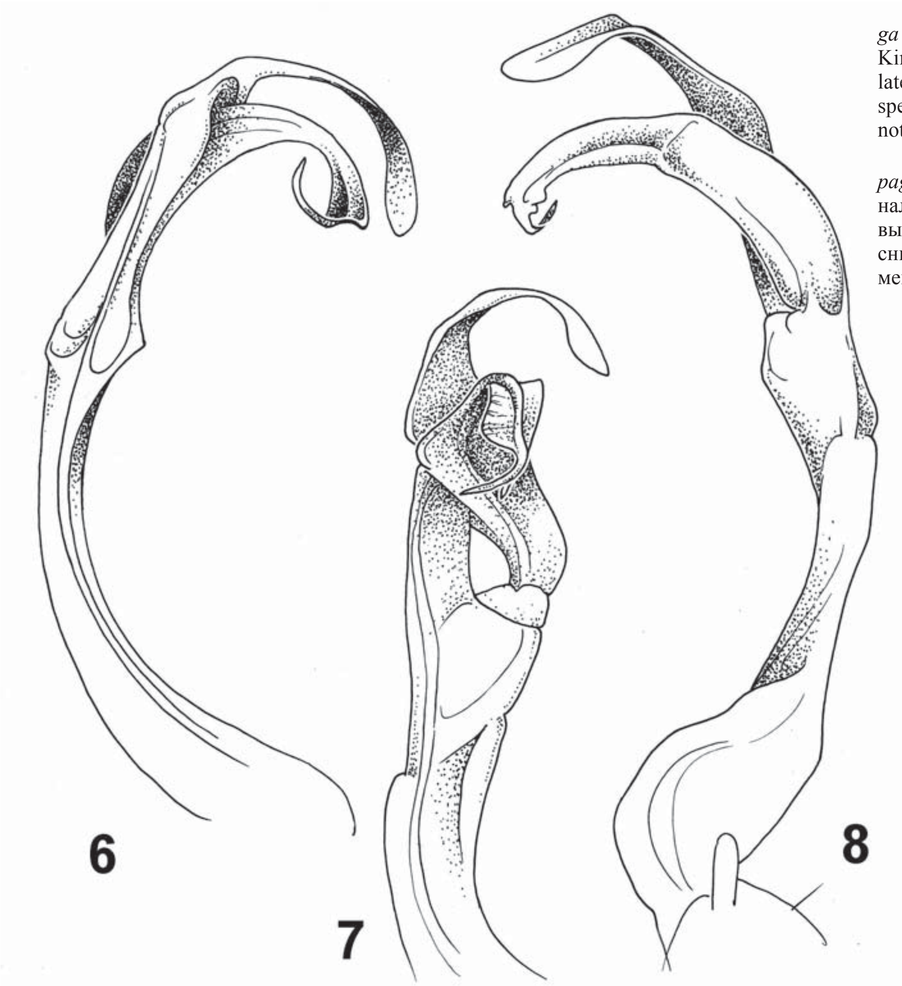
Fig. 1. Live coloration of *Antheromorpha harpaga* (Attems, 1937), ♀ from Kon Ka Kinh National Park. Picture by I.I. Semenyuk.

Рис. 1. Прижизненная окраска *Antheromorpha harpaga* (Attems, 1937), ♀ из национального парка Kon Ka Kinh. Фотография И.И. Семенюк.



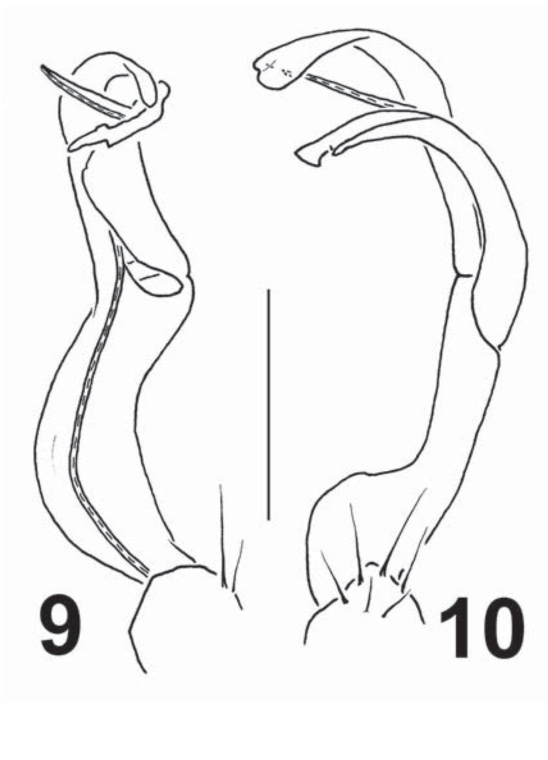
Figs 2–5. *Antheromorpha harpaga* (Attems, 1937), ♂ from Kon Ka Kinh National Park. 2 — habitus, lateral view; 3 — anterior part of body, anterodorsal view; 4 — midbody segments, dorsal view; 5 — caudal part of body, dorsal view. Pictures by K.V. Makarov, not taken to scale.

Рис. 2–5. *Antheromorpha harpaga* (Attems, 1937), ♂ из национального парка Kon Ka Kinh. 2 — общий вид, сбоку; 3 — передняя часть тела, одновременно спереди и сверху; 4 — среднетуловищные сегменты, сверху; 5 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.



Figs 6–8. *Antheromorpha harpaga* (Attems, 1937), ♂ from Kon Ka Kinh National Park, right gonopod, lateral, ventral and mesal views, respectively. Del. I.I. Semenyuk, drawn not to scale.

Рис. 6–8. *Antheromorpha harpaga* (Attems, 1937), ♂ из национального парка Kon Ka Kinh, правый гонопод соответственно сбоку, снизу и изнутри. Рисунки И.И. Семенюк, без масштаба.



m a.s.l., mixed tropical forest on slopes, on tree trunk, V.2017, all leg. I.I. Semenyuk.

REMARKS. Since this medium-sized species, often with a vivid colour pattern (Figs 1–5) and always with a characteristic gonopodal conformation (Figs 6–10), has hitherto been known only from the Khanh Hoa Province, south-central Vietnam [e.g. Nguyen *et al*., 2018], the above samples represent the first records from a neighbouring province in the southern part of the country. The new illustrations (Figs 1–10) are provided to document the species' identity.

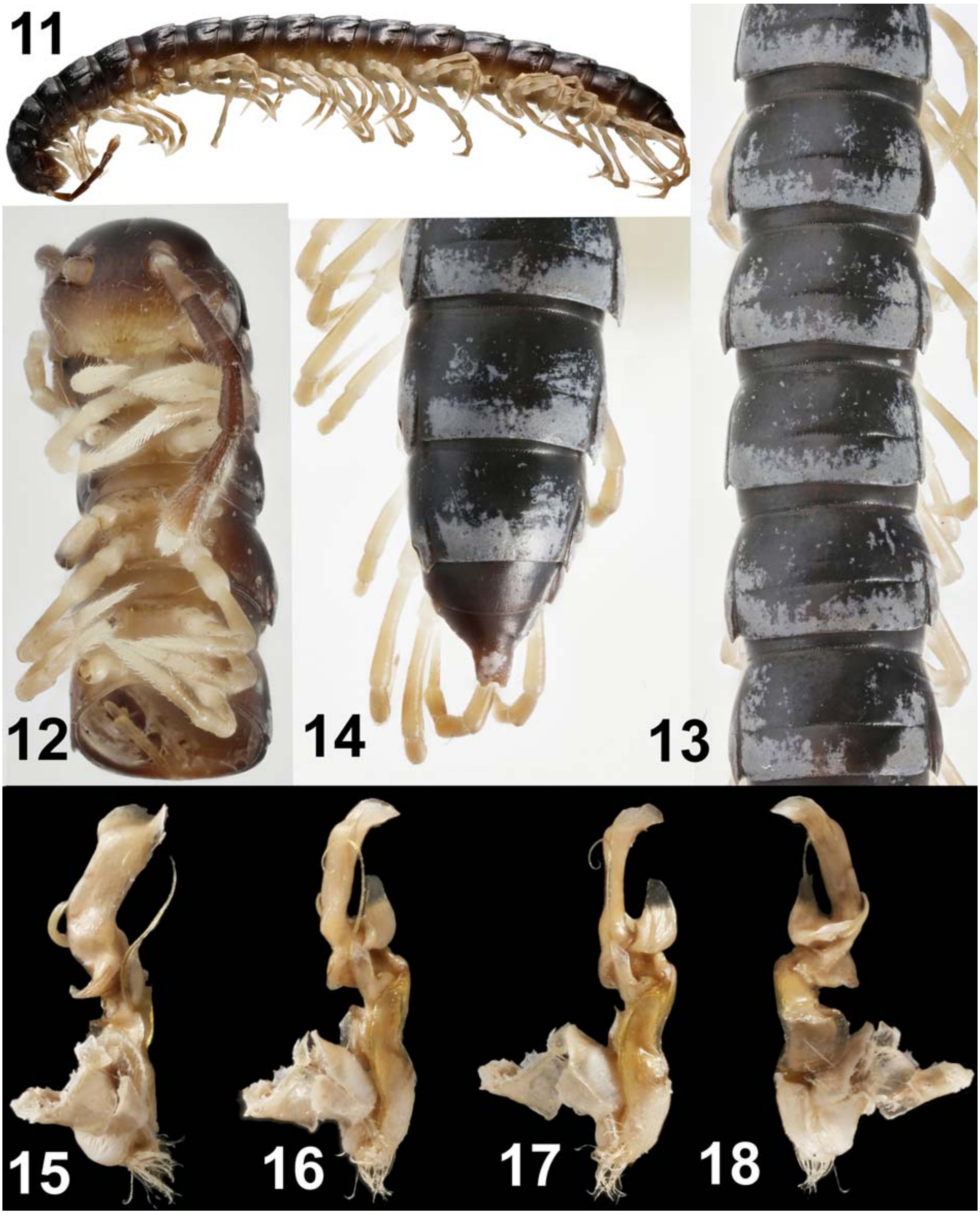
Antheromorpha uncinata (Attems, 1931)

MATERIAL. 1 ♂, Thailand, Kanchanaburi Prov., Khwae River, 2.XI.2017, leg. V. Beresnev.

REMARK. This large and colourful species is very widespread in Thailand, including the same province [Likhitrakarn *et al*., 2016a].

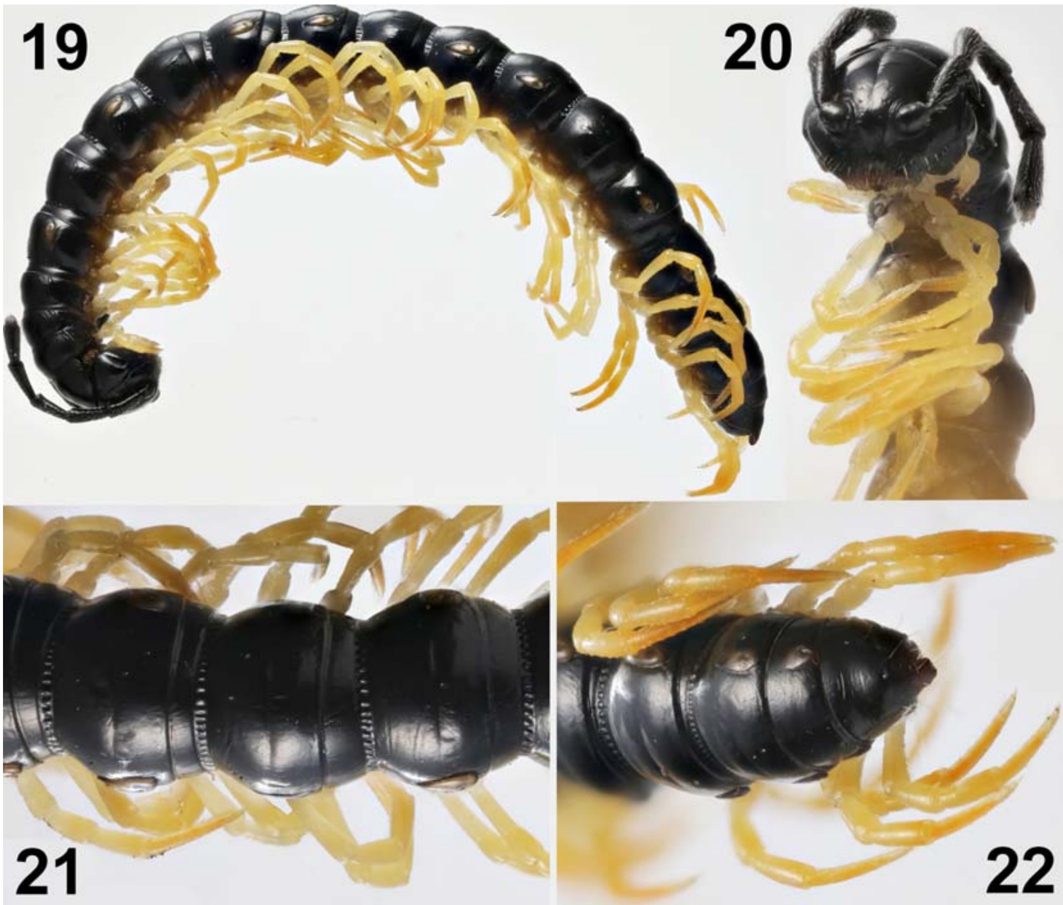
Figs 9–10. *Antheromorpha harpaga* (Attems, 1937), ♂ from Kon Ka Kinh National Park, right gonopod, ventral and mesal views, respectively. Del. S.I. Golovatch, scale bar 0.5 mm.

Рис. 9–10. *Antheromorpha harpaga* (Attems, 1937), ♂ из национального парка Kon Ka Kinh, правый гонопод, соответственно снизу и изнутри. Рисунки С.И. Головача, масштаб 0,5 мм.



Figs 11–18. *Caloma agametum* Chamberlin, 1945, ♂ from near Sarmi. 11 — habitus, lateral view; 12 — anterior part of body, ventral view; 13 — midbody segments, dorsal view; 14 — caudal part of body, dorsal view; 15–18 — left gonopod, dorsal, mesal, submesal and lateral views, respectively. Pictures by K.V. Makarov, not taken to scale.

Рис. 11–18. *Caloma agametum* Chamberlin, 1945, ♂ из окрестностей Sarmi. 11 — общий вид, сбоку; 12 — передняя часть тела, снизу; 13 — среднетуловищные сегменты, сверху; 14 — задняя часть тела, сверху; 15–18 — левый гонопод, соответственно сверху, изнутри, почти изнутри и сбоку. Фотографии К.В. Макарова, сняты без масштаба.



Figs 19–22. *Helicorthomorpha luzoniensis* (Peters, 1864), ♂ from Biak Island. 19 — habitus, lateral view; 20 — anterior part of body, anteroventral view; 21 — midbody segments, dorsal view; 22 — caudal part of body, dorsal view. Pictures by K.V. Makarov, not taken to scale.

Рис. 19–22. *Helicorthomorpha luzoniensis* (Peters, 1864), ♂ с острова Биак. 19 — общий вид, сбоку; 20 — передняя часть тела, одновременно спереди и снизу; 21 — среднетуловищные сегменты, сверху; 22 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

Aschistodesmus signatus (Attems, 1897)

MATERIAL. 2 ♂♂, 1 ♀, Eastern Imdonesia, Papua Prov., Cenderawasih Bay, northern Biak Island, ~60 km NNW of Biak, S 0°43′23″, E 135°48′13″, 50–580 m a.s.l., primary lowland rainforest on limestone cliffs, 22.III.2018, leg. D. Telnov.

REMARK. This species is known to be quite widespread in eastern Indonesia, including Halmahera, Great Kai and western New Guinea, and it has recently been recorded and illustrated from material from the Doberai Peninsula [Golovatch, 2017]. The above is the first record of *A. signatus* from the Biak Island.

Caloma agametum Chamberlin, 1945
Figs 11–18.

MATERIAL. 1 ♂, Eastern Indonesia, New Guinea, Papua Prov., Star Mountains, 13.5–19.5 km SSE of Oksibil, S 04°59′33″, E 140°42′02″ to S 05°03′02″, E 140°43′16″, 780–380 m a.s.l., primary lowland rainforest, 14.III.2018; 1 ♂, Papua Prov., Northern Lowlands, 18 km SSE of Sarmi, S 01°58′12″, E 138°51′21″, 50–65 m a.s.l., primary lowland rainforest on limestone, 27.III.2018, all leg. D. Telnov.

REMARKS. This species has hitherto been reported only from New Guinea within both Indonesia and Papua New Guinea [Hoffman, 2005; Golovatch, Stoev, 2014]. New illustrations (Figs 11–18) are provided to facilitate the species' recognition.

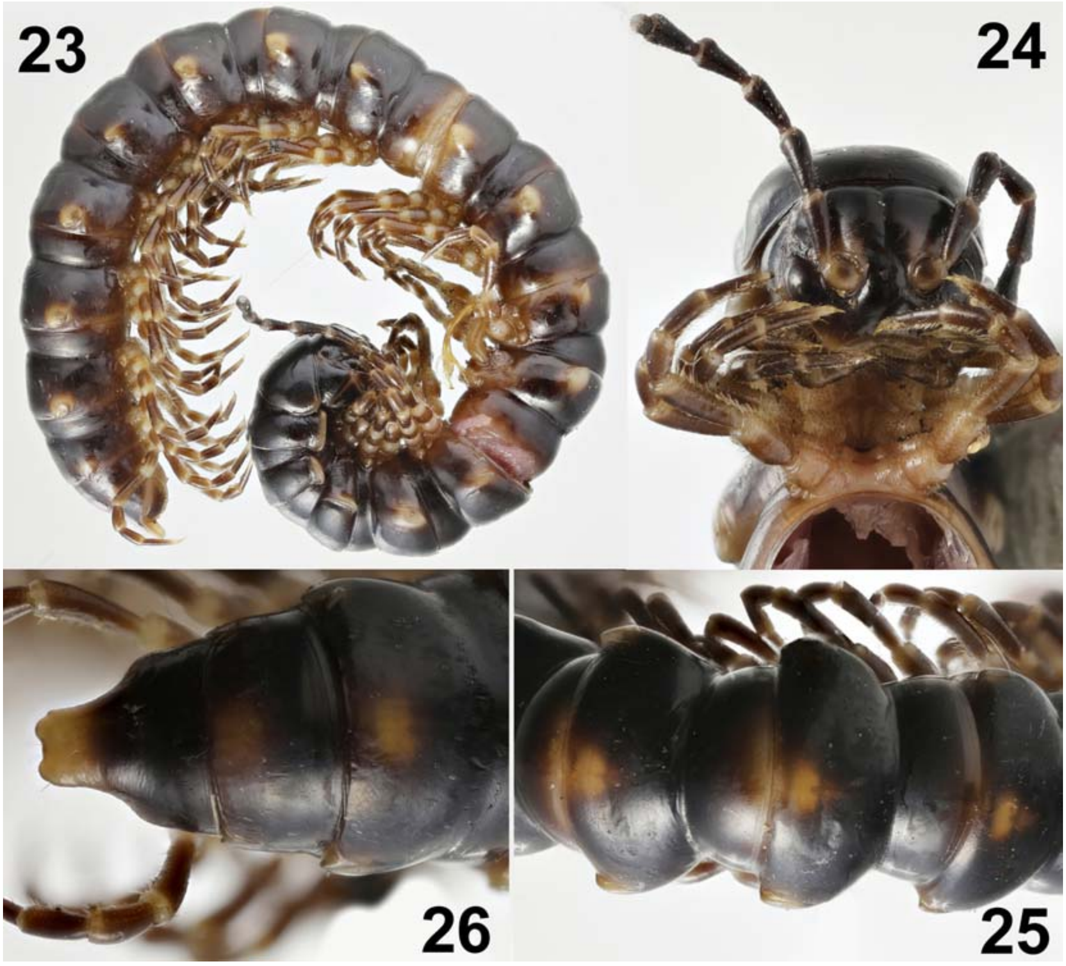
Chondromorpha xanthotricha (Attems, 1898)

MATERIAL. 1 ♀, Thailand, Phuket Island, Old Phuket Karon Beach Resort, N 7°50′39″, E 98°17′40″, 8 m a.s.l., 23–26.III.2018, leg. I.V. Enushchenko; 1 ♀, Eastern Indonesia, Papua Prov., Cenderawasih Bay, Biak Island, Biak, "Mapia" Hotel, S 01°11′04″, E 136°05′09″, 10 m a.s.l., garden, 20.–22.III.2018, leg. D. Telnov.

REMARK. This pantropical anthropochore species has only recently been recorded from Thailand, namely, the Chiang Mai Province, northern Thailand [Likhitrakarn *et al*., 2017]. The above is the first report of this species from the Phuket Island, southern Thailand, as well as from the Biak Island, Indonesia.

Helicorthomorpha luzoniensis (Peters, 1864)
Figs 19–22.

MATERIAL. 1 ♂, Eastern Indonesia, Papua Prov., Cenderawasih Bay, eastern Biak Island, ca 34 km ENE of Biak, S 01°04′50″, E 136°22′08″, 10–15 m a.s.l., primary lowland rainforest, 22.III.2018, leg. D. Telnov.



Figs 23–26. *Dendrogonopus aster* sp.n., ♂ holotype. 23 — habitus, lateral view; 24 — anterior part of body, anteroventral view; 25 — midbody segments, dorsal view; 26 — caudal part of body, dorsal view. Pictures by K.V. Makarov, not taken to scale.

Рис. 23–26. *Dendrogonopus aster* sp.n., голотип ♂. 23 — общий вид, сбоку; 24 — передняя часть тела, одновременно спереди и снизу; 25 — среднетуловищные сегменты, сверху; 26 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

REMARK. This beautiful, widespread, obviously anthropochore species is known to range from southern China to New Guinea [Golovatch, Stoev, 2014]. The above material is the first formal record from the Biak Island, Indonesia. New illustrations (Figs 19–22) are provided to facilitate the species' recognition.

Orthomorpha coarctata (De Saussure, 1860)

MATERIAL. 1 ♀, Thailand, Phuket Island, Old Phuket Karon Beach Resort, N 7°50′39″, E 98°17′40″, 8 m a.s.l., 23.–26.III.2018, leg. I.V. Enushchenko; 1 ♀, Thailand, Kanchanaburi Prov., Khwae River, 2.XI.2017, leg. V. Beresnev; 2 ♀♀, Eastern Indonesia, Papua Prov., Cenderawasih Bay, Biak Island, Biak, "Mapia" Hotel, S 01° 11′04″, E 136°05′09″, 10 m a.s.l., garden, 20.–22.III.2018, 1 ♀, Papua Prov., Cenderawasih Bay, eastern Biak Island, ca 11 km E of Biak, at Biak Bird park, S 01°10′39″, E 136°10′33″, 40–70 m a.s.l., primary lowland rainforest on limestone, 21.III.2018, 5 ♂♂, 4 ♀♀, Papua Prov., Cenderawasih Bay, eastern Biak Island, ca 34 km ENE of Biak, S 01°04′50″, E 136°22′08″, 10–15 m a.s.l., primary lowland rainforest, 22.III.2018; all leg. D. Telnov.

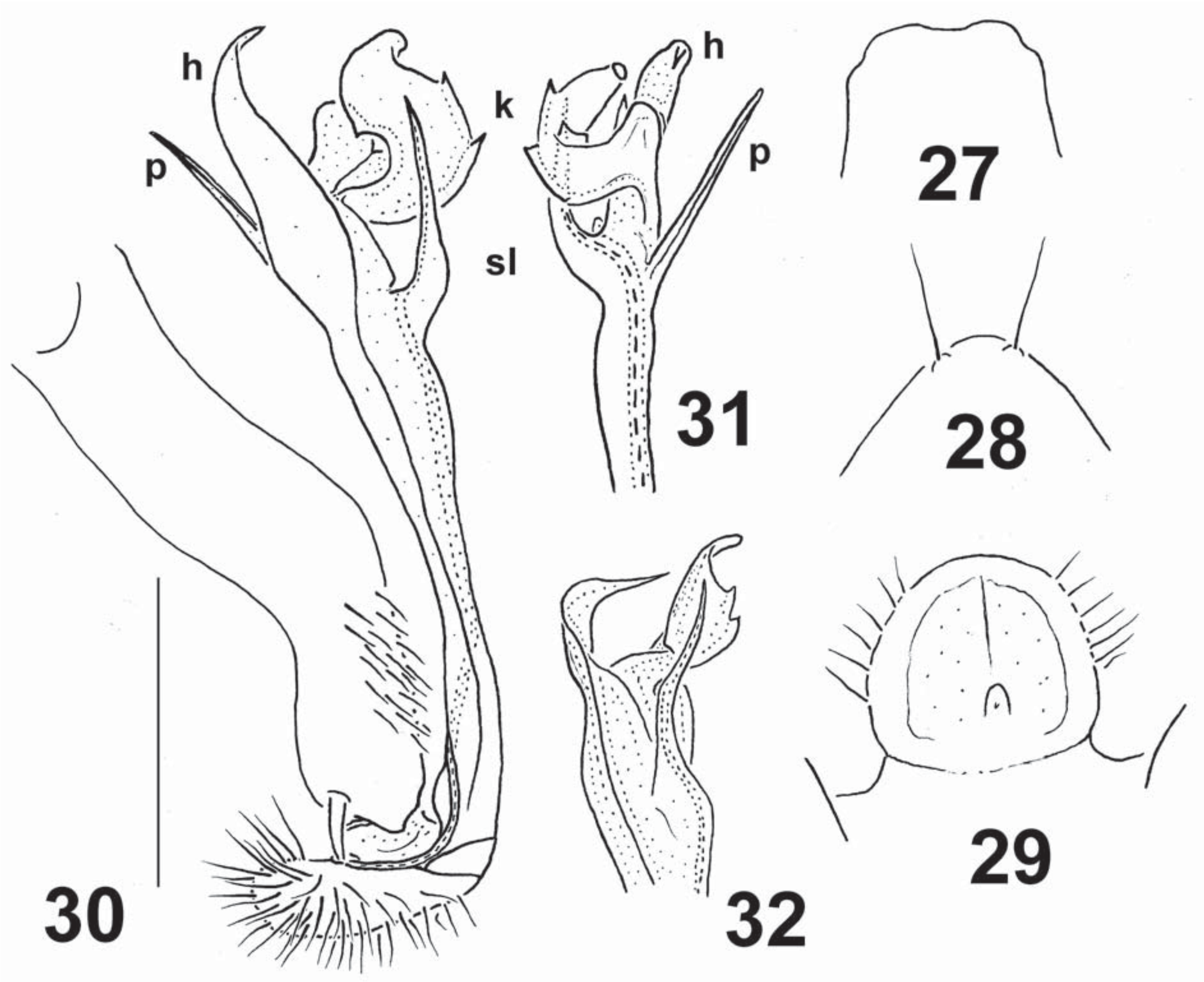
REMARK. This pantropical anthropochore species has long been known to occur throughout Thailand, including Phuket Island [Likhitrakarn *et al*., 2017], as well as across Indonesia, even though the above are the first formal records from the Biak Island.

Dendrogonopus aster **sp.n.**
Figs 23–35.

MATERIAL. 1 ♂, Eastern Indonesia, New Guinea, Papua Prov., Star Mountains, N of Oksibil, S 4°54′01″, E 140°38′48″, 1350–1380 m a.s.l., gardens & secondary lower montane rainforest on limestone, 10.III.2018, leg. D. Telnov.

NAME. The species' name reflects its provenance from the Star Mountains; noun in apposition.

DIAGNOSIS. Based on the available information, including a key [Jeekel, 1964; Golovatch, Stoev, 2014], the genus *Dendrogonopus* Jeekel, 1964 has hitherto been known to contain three species, all from New Guinea: *D. beroni* Golovatch et Stoev, 2014, *D. maculatus* (Silvestri, 1895) and *D. robustus* Jeekel, 1964. Due to the concave epiproct tip and a subcircular sternal lobe between ♂ coxae 4, the new species keys out to *D. beroni*, but differs primarily by the densely setose gonopodal coxite and the somewhat longer, acuminate and more slender processes **p** and **h**, as well as the longer and more slender solenomere (**sl**) of the gonopo-



Figs 27–32. *Dendrogonopus aster* sp.n., ♂ holotype. 27 — tip of epiproct, dorsal view; 28 — hypoproct, ventral view; 29 — sternal lobe between coxae 4, caudal view; 30 — left gonopod, mesal view; 31–32 — distal part of left gonopod, lateral and ventral views, respectively. Del. S.I. Golovatch, scale bar 1.0 mm. Designations explained in text.

Рис. 27–32. *Dendrogonopus aster* sp.n., голотип ♂. 27 — кончик эпипрокта, сверху; 28 — гипопрокт, снизу; 29 — стернальная пластина между тазиками 4, сзади; 30 — левый гонопод, изнутри; 31–32 — дистальная часть левого гонопода, соответственно сбоку и снизу. Рисунки С.И. Головача, масштаб 1,0 мм. Объяснения обозначений даны в тексте.

dal telopodite (Figs 30–35) as compared to *D. beroni* [Golovatch, Stoev, 2014].

DESCRIPTION. Holotype ca 38 mm long, width of midbody pro- and metazonae 3.2 and 4.2 mm, respectively. General coloration in alcohol dark chocolate brown with a characteristic pattern of contrasting light, yellowish, caudal 1/3 of postcollum paraterga (a little clearer and larger around ozopores), epiproct tip and small, central, vague, subtriangular to roundish spots in caudal 1/4 of collum and in caudal 1/3 of all following metaterga (Figs 23–26).

Clypeolabral region sparsely setose, frons and vertigial region bare; epicranial suture deep and distinct (Fig. 24). Antennae long and only slightly clavate, in situ extending back to segment 4 when stretched dorsally (♂); antennomere 2 = 3 > 4 = 5 = 6 > 1 = 7; interantennal isthmus about as broad as diameter of antennal socket (Figs 23, 24).

In width, head < collum < segment 2 = 3 < 4 < 5–16; thereafter body gradually tapering towards telson. Tegument smooth and shining throughout, including surface below paraterga; prozonae finely shagreened/alveolate; metaterga in places very finely longitudinally rugulose in rear halves, especially so near paraterga. Collum broadly and regularly rounded laterally. Paraterga of segment 2 particularly low, rounded at both ends, subrectangular and drawn a little forward and extending caudad behind tergal margin (Fig. 23). Paraterga 3 similar but smaller (Fig. 23). Further paraterga moderately developed, mostly coniform, evident and set at about upper 1/3 of body height (Fig. 23), somewhat thicker on pore-bearing segments compared to poreless ones, smooth and rounded laterally, never drawn behind rear tergal margin, each callus in caudal half of paratergum set off by a sulcus dorsally and another sulcus ventrally; caudolateral corner a small obtuse tooth; ozopores lateral, invisible from above, lying inside a round pit near caudal corner (Figs 23–26). Transverse metatergal sulci poorly developed, far from reaching the bases of paraterga, smooth, thin, shallow impressions on segments 5 and 18, faint and incomplete lines on segments 6–17. Tergal setae missing (fully abraded?), setation pattern untraceable. Stricture dividing pro- and metazonae thin and shallow, very faintly striolate to nearly smooth at bottom. Pleurosternal carinae traceable as small, granulated, arcuated lobes or ridges only on segments



Figs 33–35. *Dendrogonopus aster* sp.n., ♂ holotype, left gonopod, lateral, subventral and mesal views, respectively. Pictures by K.V. Makarov, not taken to scale.

Рис. 33–35. *Dendrogonopus aster* sp.n., голотип ♂, левый гонопод, соответственно сбоку, почти снизу и изнутри. Фотографии К.В. Макарова, сняты без масштаба.

2–4, thereafter missing. Axial line absent. Epiproct conical, slightly emarginate at apex, subapical lateral papillae small, but evident (Figs 26, 27). Hypoproct (Fig. 28) roundly subtriangular, caudal 1+1 setae well-separated, borne on small knobs.

Sterna sparsely setose, shining, cross-impressions moderate; each caudal sternum with a pair very small knobs near coxa; a subcircular, setose, caudally flattened lobe with a central parabasal knob (Fig. 29) between coxae 4 (♂); a prominent, rounded, densely setose, transverse, sternal ridge in front of gonopodal aperture (Fig. 23). A large, conical, parabasal, ventral, setose adentostyle present only on femur 1 (♂). Legs long, slender, apparently incrassate compared to ♀, ca 1.6–1.7 times as long as midbody height (♂), densely setose ventrally until midbody legs, but thereafter brushes gradually thinning out even on prefemora and tarsi (♂); prefemora not inflated laterally; in length, femora > prefemora = tarsi > postfemora = tibiae > coxae; claw simple, gently curved (Fig. 23).

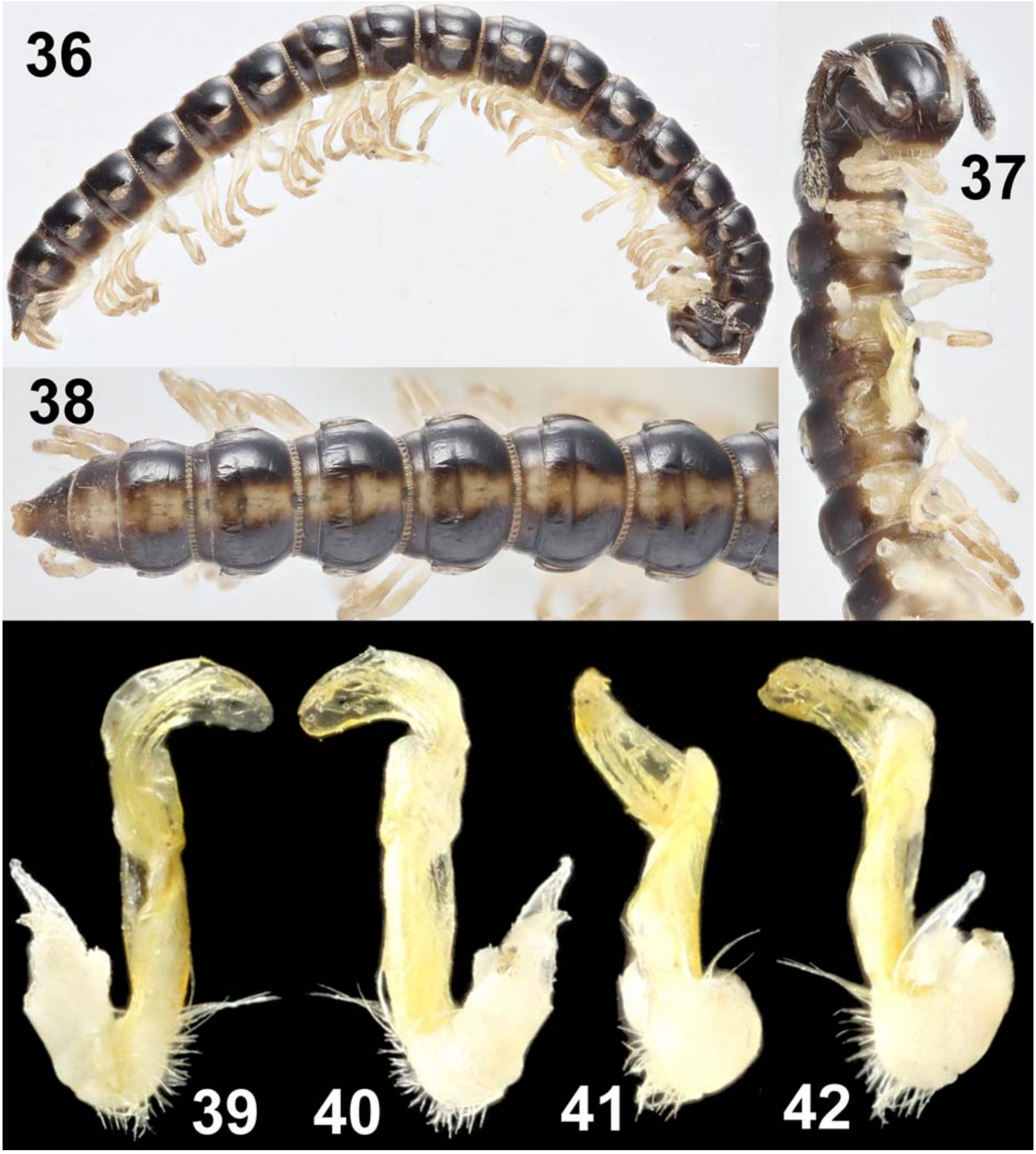
Gonopods (Figs 30–35) very long and slender, with a sinuate and unusually densely setose coxite, the latter almost as long as telopodite. Prefemoral (= densely setose) part very short, delimited from acropodite by two sulci, the distal of which reflecting femorite torsion. Seminal groove quickly moving laterad to proceed along lateral side of a dorsoventrally distinctly flattened and distally enlarged femorite before moving onto a long, slender, ventral, gradually attenuating and somewhat curved solenomere (**sl**). Solenophore about half as long as femorite proper, consisting of three main parts. Process **p** very long, slender, spiniform, starting dorsally opposite **sl** base. Process **h** longest, hyaline, dorsomesal in position, also gradually attenuating, ending in a laterally curved spinicle. Process **k** largest, much more complex, strongly sigmoid, lateral in position, with several sharp denticles at margin.

Tylopus monospinosus sp.n.
Figs 36–47.

HOLOTYPE ♂, Vietnam, Gia Lai Province, Kon Ka Kinh National Park, N 14°12′46″, E 108°18′55″, 800 m a.s.l., bottom of river valley with wet broadleaved tropical forest, leaf litter, V.2017, leg. I.I. Semenyuk.

NAME. To emphasize the presence of only a single, long and retrorse spine on the gonopodal telopodite.

DIAGNOSIS. Based on the latest available review and key [Likhitrakarn *et al*., 2016b], as well as considering further two species described since [Golovatch *et al*., 2016] and one more below, the large Oriental genus *Tylopus* Jeekel, 1968 is currently known to encompass 67 species from Indochina and the adjacent parts of southern China and Myanmar. Most of the species (31, or > 50%) come from Thailand, followed by Vietnam (18), Laos (7), southern China (6) and Myanmar (4). Country endemism is close to 100%, as only *T. doriae* (Pocock, 1895) and *T. nodulipes* (Attems, 1953) have been recorded from two of the countries at once (Myanmar and Thailand, and Vietnam and Laos, respectively). This new species keys out to couplet 38 which contains two species, *T. moniliformis* Likhitrakarn, Golovatch et Panha, 2016, from Laos, and *T. hongkhraiensis* Likhitrakarn, Golovatch et Panha, 2016, from Thailand [Likhitrakarn *et al*., 2016b], but differs readily from both in the slightly more strongly developed paraterga (Figs 36–38), the presence of a particularly high and broadly rounded lateral lobe (**l**) and only one, long and retrorse spine (**z**) in the postfemoral part of the gonopodal telopodite (Figs 46–47). It differs from most other congeners also by the distinctly moniliform body, the presence of a clear-cut tergal pattern, the absence of adenostyles, of an abundant tergal setation, of lateral denticulations on paraterga, of sternal cones and of a mesal gonopodal excavation, as well as in the



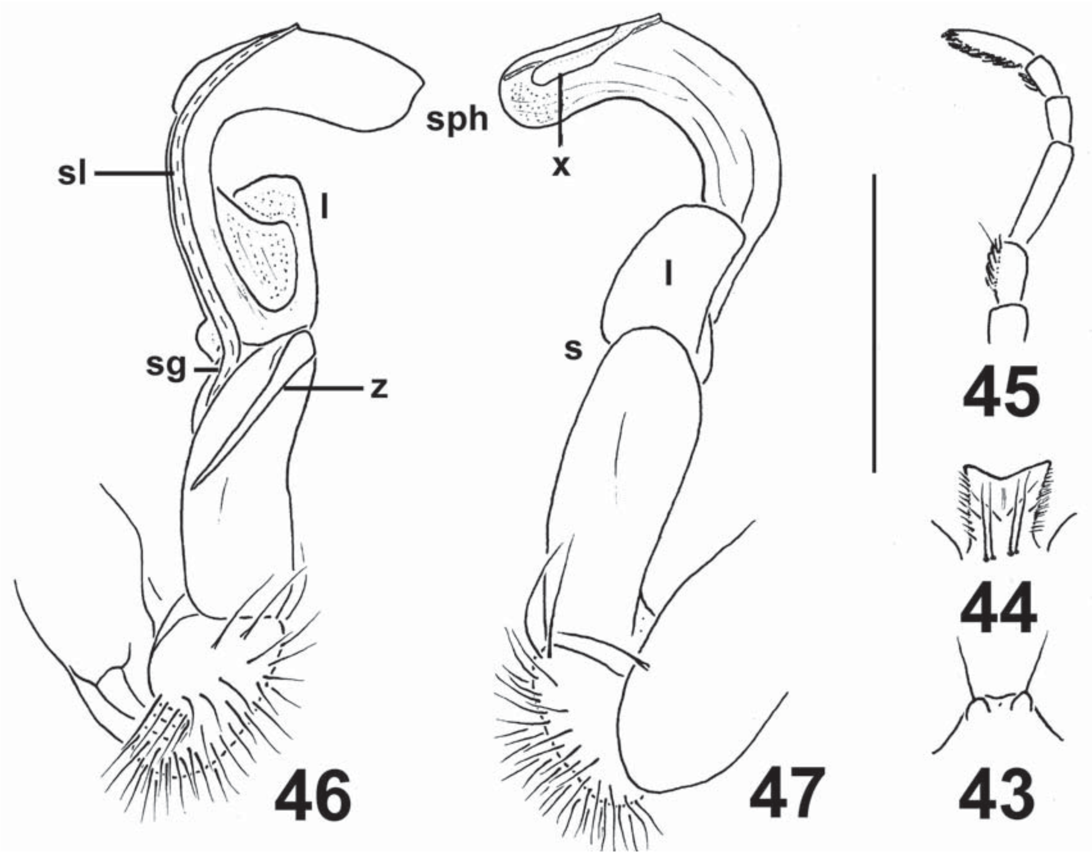
Figs 36–42. *Tylopus monospinosus* sp.n., ♂ holotype. 36 — habitus, lateral view; 37 — anterior part of body, anteroventral view; 38 — caudal half of body, dorsal view; 39–42 — left gonopod, mesal, lateral, ventral and dorsal views, respectively. Pictures by K.V. Makarov, not taken to scale.

Рис. 36–42. *Tylopus monospinosus* sp.n., голотип ♂. 36 — общий вид, сбоку; 37 — передняя часть тела, одновременно спереди и снизу; 38 — задняя часть тела, сверху; 39–42 — левый гонопод, соответственно изнутри, сбоку, снизу и сверху. Фотографии К.В. Макарова, сняты без масштаба.

♂ femora being non-inflated laterally (Fig. 45), and both the hypoproct (Fig. 43) and the sternal lobe between ♂ coxae 4 (Fig. 44) being peculiar in shape.

DESCRIPTION. Holotype ca 10 mm long, width of midbody pro- and metazonae 0.7 and 0.9 mm, respectively. General coloration in alcohol dark chocolate brown with a characteristic pattern of contrasting light, nearly pallid paraterga and a broad, somewhat irregular, but complete, axial stripe running from collum to epiproct tip, as well as mostly yellowish strictures between pro- and metazonae; venter light grey, legs increasingly, but only light brown distally (Figs 36–38).

Clypeolabral region sparsely setose, vertigial one bare; epicranial suture thin, but evident (Fig. 37). Antennae long



Figs 43–47. *Tylopus monospinosus* sp.n., ♂ holotype. 43 — hypoproct, ventral view; 44 — sternal lobe between coxae 4, caudal view; 45 — leg 9, lateral view; 46–47 — left gonopod, mesal and lateral views, respectively. Del. S.I. Golovatch, scale bar 1.0 (43–45) or 0.5 mm (46–47).

Рис. 43–47. *Tylopus monospinosus* sp.n., голотип ♂. 43 — гипопрокт, снизу; 44 — стернальная пластина между тазиками 4, сзади; 45 — нога 9, сбоку; 46–47 — левый гонопод, соответственно изнутри и сбоку. Рисунки С.И. Головача, 1,0 (43–45) и 0,5 мм (46–47). Объяснения обозначений даны в тексте.

and only slightly clavate, in situ extending back to segment 4 when stretched dorsally (♂); antennomere 2 = 3 = 4 = 5 = 6 > 1 = 7; interantennal isthmus about as broad as diameter of antennal socket.

In width, segment 2 = 3 < collum = segment 4 < head = 5–15; thereafter body gradually tapering towards telson. Tegument smooth, shining; prozonae finely shagreened/alveolate; metaterga finely longitudinally rugulose in rear halves; surface below paraterga shining, but finely microgranulate. Collum broadly and regularly rounded laterally. Postcollum paraterga poorly developed, but evident, mostly set at about half of body height (Fig. 36), thicker on pore-bearing segments compared to poreless ones, smooth and rounded laterally, each callus completely set off by a sulcus dorsally, but only in caudal 1/2–2/3 by a less distinct sulcus ventrally; caudolateral corner a small subrectangular, often slightly rounded or pointed denticle; ozopores lateral, invisible from above, lying inside an ovoid groove at about 1/3 of metatergal length off caudolateral corner (Figs 36–38). Transverse metatergal sulci evident, smooth, thin, not reaching the bases of paraterga, present on segments 5–17, faint and incomplete on segment 18, absent from 19th. Tergal setae mostly abraded, about 1/3 as long as metaterga, setation pattern apparently 2+2 in an anterior row. Stricture dividing pro- and metazonae thin and deep, clearly beaded at bottom down to below paraterga. Pleurosternal carinae evident, rounded, low, granulated lobes increasingly enlarged to segment 7, thereafter missing. Axial line absent. Epiproct conical, emarginate at apex, subapical lateral papillae small, but evident (Fig. 38). Hypoproct (Fig. 43) subtrapeziform, caudal 1+1 setae well-separated, borne on knobs.

Sterna sparsely setose, without modifications except for a squarish, emarginate, setose lobe (Fig. 44) between coxae 4 (♂); cross-impressions moderate. Adenostyles missing. Legs long, slender, 1.6–1.7 times as long as midbody height (♂); in length, femora > tarsi > tibiae = prefemora > coxae = postfemora; claw unusually small (Fig. 45); prefemora not inflated laterally (Fig. 45). Tarsal brushes distinct, present on all legs (♂), in anterior body half ventral brushes present also on tibiae and prefemora (Fig. 45), but gradually thinning out towards telson.

Gonopods (Figs 39–42, 46, 47) relatively simple, in situ held parallel to each other; coxite much shorter than telopodite, slender, subcylindrical, with a single long seta distoventrally; telopodite slender, suberect, subcylindrical, devoid of a mesal excavation, shorter than acropodite, carrying a seminal groove (**sg**) entirely on mesal face; prefemoral (= densely setose) region about half as long as femorite; set off apically from both a long, twisted, ribbon-shaped, hyaline solenophore (**sph**) and an unusually high, squarish,



Fig. 48. Live coloration of *Tylopus tuberculatus* sp.n., ♀ paratype. Picture by I.I. Semenyuk.
Рис. 48. Прижизненная окраска *Tylopus tuberculatus* sp.n., паратип ♀. Фотография И.И. Семенюк.

lateral lobe (**l**) by a lateral postfemoral sulcus (**s**); a conspicuous, long, spiniform, retrorse process (**z**) tightly appressed to femorite starting ventrally at **s**; **sg** distodorsally passing onto a free solenomere (**sl**), the latter about as long as **sph**, flagelliform, its distal part sheathed by an additional, elongated, apically rounded, lateral lobule (**x**) near end of a broadly and almost regularly broadened **sph,** leaving **sl** tip barely exposed.

Tylopus tuberculatus sp.n.
Figs 48–59.

HOLOTYPE ♂, Vietnam, Gia Lai Province, Kon Ka Kinh National Park, N 14°13′25″, E 108°20′02″, 1400 m a.s.l., upper part of hill with mixed tropical forest, leaf litter, V.2017, leg. I.I. Semenyuk.

PARATYPE: 1 ♀, same data, together with holotype.

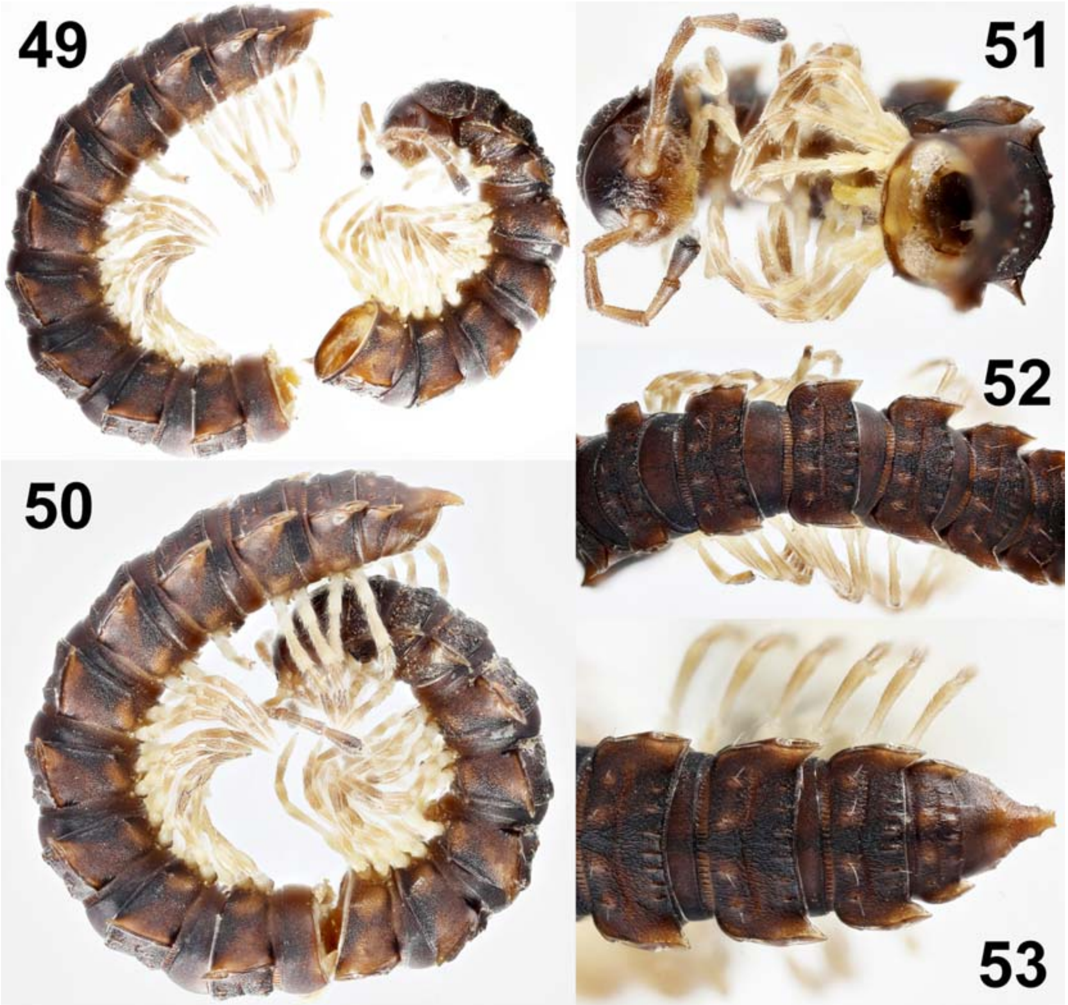
NAME. To emphasize the clearly tuberculate metaterga; adjective.

DIAGNOSIS. Based on the latest available review and key [Likhitrakarn *et al*., 2016b], as well as considering further two species described since [Golovatch *et al*., 2016] and one more documented above, *T. tuberculatus* sp.n. keys out to couplet 34 which contains two species, *T. thunghaihin* Likhitrakarn, Golovatch et Panha, 2016, from Laos, and *T. spinisterna* Nguyen, 2012, from Vietnam. The new species shares with the former taxon the presence of only one incision on the paraterga and of pleurosternal carinae until segment 16 [Likhitrakarn *et al*., 2016b], but differs clearly in a fewer number and different shapes of the distal gonopodal outgrowths.

DESCRIPTION. Holotype ca 24 mm long, width of midbody pro- and metazonae 1.2 and 2.0 mm, respectively. Paratype ca 25 mm long, width of midbody pro- and metazonae 2.3 and 3.2 mm, respectively. General coloration, both live and in alcohol (Figs 48–53), dark chocolate brown with a characteristic pattern of contrasting lighter, reddish brown, tergal tubercles, rear halves of paraterga and epiproct; prozonae with a more vague, brown, wide, dorsal stripe divided by a narrow, dark, axial line; legs contrasting light creamy to increasingly grey-brown distally.

Entire head very densely setose, vertigial region more sparsely so; epicranial suture thin, but evident (Fig. 51). Antennae long and only slightly clavate, in situ extending back to segment 4 when stretched dorsally (♂); antennomere 2 = 3 = 4 = 5 = 6 > 1 = 7; interantennal isthmus about as broad as diameter of antennal socket (Figs 49–51).

In width, head < collum < segment 2 = 3 < 4 < 5–17; thereafter body gradually tapering towards telson. Tegument dull, coriaceous and granulate, including surface below paraterga; only prozonae shagreened. Collum broadly and regularly rounded laterally before a slightly upturned, subrectangular and more narrowly rounded caudal corner, with a few very small, at least partly setigerous incisions at lateral margin (Fig. 49). Postcollum paraterga regularly rounded anteriorly and acute spines caudally, invariably drawn behind rear tergal margin, particularly well so in segments 17–19, a little better developed in ♂ compared to ♀, only slightly thicker on pore-bearing segments than on poreless ones, generally thin and keel-shaped, mostly subhorizontal to faintly upturned, set high at about dorsal 1/3–1/4, especially high in ♂. Each postcollum paratergum with an obvious, setigerous, lateral incision in anterior 1/3, all calluses being thin and delimited by complete sulci both dorsally and ventrally. Ozopores lateral, traceable in dorsal view only through a slightly sinuous callus in posterior 1/3 of paratergum, lying inside a longitudinal groove. Collum with three transverse rows of characteristic, usually longitudinally oblong, rounded, setigerous, small tubercles: 4+4, 1+1 and 2+2 in anterior, middle and caudal rows, respectively. Following metaterga always with 2+2 similar tubercles in anterior row, but with 2+2 or 3+3 in caudal rows in segments 2–7 and 8–19, respectively; occasionally 3+4 in caudal row on caudalmost segments. Transverse metatergal sulci well-developed, reaching the bases of paraterga, roughly coriaceous, fully present on segments 5–18, incomplete and barely traceable on segment 19. Tergal setae pallid, each ca 1/4 as long as metatergum. Axial impression absent. Strictures dividing pro- and metazonae evident, broad and clearly ribbed dorsally, rugose to rugulose further ventrad (Figs 49–53). Pleurosternal carinae increasingly strong, granulated and arcuated ridges with a sharp caudal tooth until segment 7, thereafter increasingly strongly reduced, still with small caudal teeth in segments 8–10, but small arcuated ridges without teeth until segment 16 (♂), somewhat reduced and devoid of caudal teeth in ♀. Epiproct long, conical, slightly emarginate at apex, subapical lateral papillae very obvious (Figs 49, 50, 53). Hypoproct roundly subtrapeziform, caudal 1+1 setae well-separated, borne on small knobs.



Figs 49–53. *Tylopus tuberculatus* sp.n., ♂ paratype. 49–50 — habitus, lateral view; 51 — anterior part of body, ventral view; 52 — midbody segments, dorsal view; 53 — caudal part of body, dorsal view. Pictures by K.V. Makarov, not taken to scale.

Рис. 49–53. *Tylopus tuberculatus* sp.n., паратип ♂. 49–50 — общий вид, сбоку; 51 — передняя часть тела, снизу; 52 — среднетуловищные сегменты, сверху; 53 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

Sterna densely setose, cross-impressions faint, a small sharp cone near each coxa and a central, high, roundly subquadrate, faintly emarginate, setose lobe between coxae 4 (♂). Adentostyles absent. Legs long, slender, incrassate in ♂ compared to ♀, ca 1.6–1.7 (♂) or 1.1–1.2 times as long as midbody height (♀), densely setose ventrally until midbody legs, but thereafter brushes gradually thinning out even on prefemora and tarsi (♂); prefemora not inflated laterally; in length, femora > prefemora = tibiae = tarsi > postfemora = coxae; claw simple, small, gently curved (Figs 49–53).

Gonopods (Figs 54–59) more complex, prefemoral (= densely setose) part about half as long as femorte, the latter somewhat enlarged distad and with an obvious mesal excavation; postfemoral sulcus (**s**) demarcating a low, subtriangular, lateral lobe (**l**) connected at base with a similarly high, mesal, sharp ridge (**z**) and carrying at base both a long, sigmoid, spiniform process (**h**) and an even longer, coiled, apically bifid solenophore (**sph**), the latter sheathing much of a long, flagelliform, independent solenomere (**sl**).

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Figs 54–56. *Tylopus tuberculatus* sp.n., ♂ paratype, left gonopod, lateral, mesal and subventral views, respectively. Pictures by K.V. Makarov, not taken to scale.

Рис. 54–56. *Tylopus tuberculatus* sp.n., паратип ♂, левый гонопод, соответственно сбоку, изнутри и почти снизу. Фотографии К.В. Макарова, сняты без масштаба.

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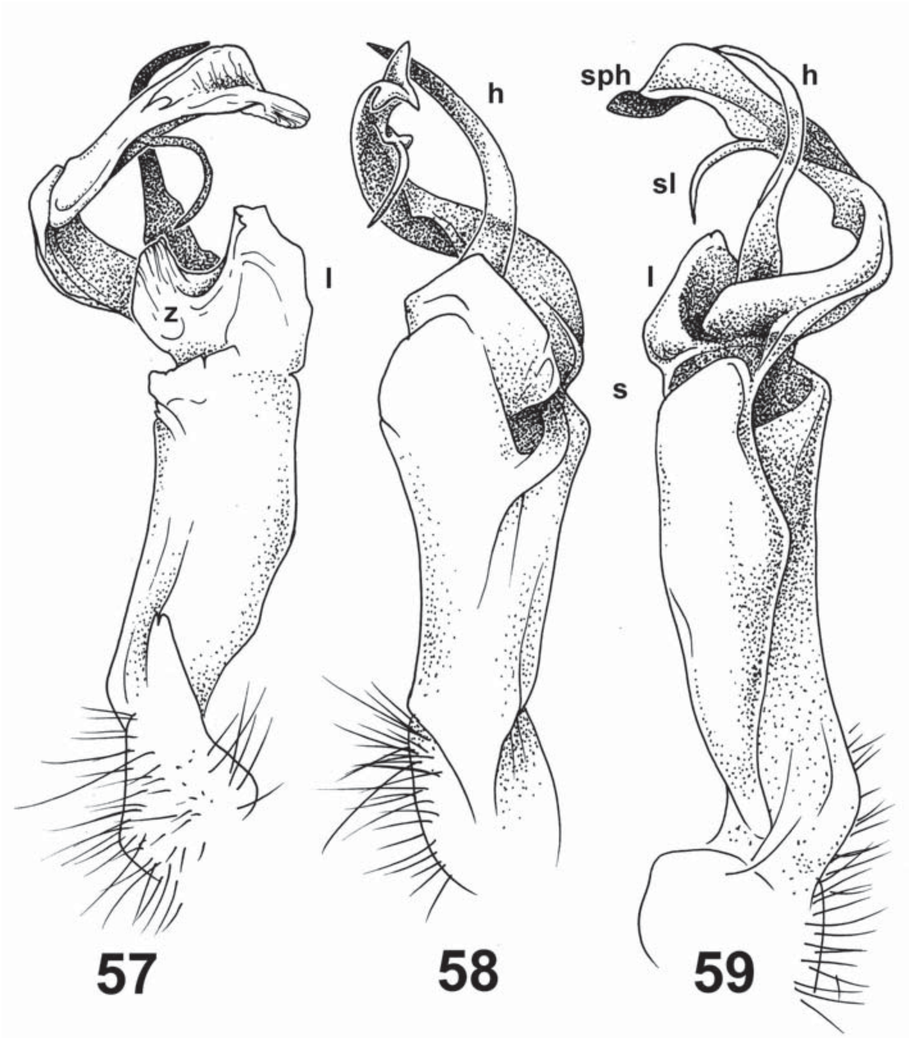
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Figs 57–59. *Tylopus tuberculatus* sp.n., ♂ paratype, left gonopod, lateral, ventral and mesal views, respectively. Del. I.I. Semenyuk, drawn not to scale. Designations explained in text.

Рис. 57–59. *Tylopus tuberculatus* sp.n., паратип ♂, левый гонопод, соответственно сбоку, снизу и изнутри. Рисунки И.И. Семенюк, без масштаба. Объяснения обозначений даны в тексте.